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## GEOMETRY.

**412. Proposed by S. LEFSCHETZ, The University of Nebraska.**

To inscribe in a given circle an isosceles triangle in which the base plus the altitude is equal to a given length.

**413. Proposed by D. F. KELLY, New York City.**

To construct a triangle, having given the base, vertical angle and the ratio of the altitude to the difference of the other two sides.

**414. Proposed by H. C. FEEMSTER, York, Neb.**

To construct the cyclic quadrilateral, having given its four sides.

## CALCULUS.

**334. Proposed by ELMER SCHUYLER, Brooklyn, N. Y.**

Solve the differential equation:

$$\frac{\partial^2 T}{\partial u \partial v} + \frac{2v}{u^2 + v^2 + 1} \frac{\partial T}{\partial u} + \frac{2u}{u^2 + v^2 + 1} \frac{\partial T}{\partial v} = 0.$$

**335. Proposed by W. R. LEBOLD, Cambridge, Ohio.**

Let  $\rho = F(\theta, \phi)$  be the equation in polar coordinates of a closed surface. Show that the volume of the solid bounded by the surface is equal to the double integral.

$$\frac{1}{3} \iint \rho \cos \gamma \, d\sigma$$

extended over the whole surface, where  $d\sigma$  represents the element of area, and  $\gamma$  the angle which the radius vector makes with the exterior normal.

[Goursat-Hedrick, *Analysis*, p. 325, ex. 9.]

**336. Proposed by EVA S. MAGLOTT, Ada, Ohio.**

If a right cone stands on an ellipse, prove that its superficial area is

$$\frac{\pi}{2} (OA + OA')(OA \cdot OA')^{\frac{1}{2}} \sin \alpha,$$

where  $O$  is the vertex of the cone,  $A$  and  $A'$  the extremities of the major axis of the ellipse, and  $\alpha$  is the semi-angle of the cone.

## MECHANICS.

**271. Proposed by B. F. FINKEL, Springfield, Mo.**

A hollow spherical shell is filled with a frictionless fluid and rolls down a rough inclined plane. After rolling  $t$  seconds, the fluid suddenly solidifies. Determine the subsequent motion of the spherical shell.

**272. Proposed by J. F. LAWRENCE, Stillwater, Okla.**

A perfectly rough circular cylinder is fixed with its axis horizontal. A sphere is placed on it in a position of unstable equilibrium, and projected with a given velocity parallel to the axis of the cylinder. If the sphere be slightly disturbed in a horizontal direction perpendicular to the direction of the axis of the cylinder, determine at what point the sphere will leave the cylinder.

**273. Proposed by F. P. MATZ, Reading, Pa.**

A person is placed on a perfectly smooth surface. How may he get off?

## NUMBER THEORY AND DIOPHANTINE ANALYSIS.

**187. Proposed by E. T. BELL, New York, N. Y.**

If  $m$  is any integer,  $P$  the product of all the distinct prime factors of  $m$  and  $\lambda$  their number, and if  $N(x)$  denote the number of divisors of  $x$ , then